Space Weather Forecast

Issued on Thursday, 09 May 2024 at 00:35 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further X-class flares (R3 - Strong radio blackouts) likely. Chance of G2-G3/Moderate-Strong geomagnetic storm conditions on 10 May.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been High. Two large and complex sunspot regions in the northwest and southwest of the visible disc have produced frequent Moderate flares during the period as well as a single Strong flares apiece. The region in the northwest is approaching the western limb, making analysis of its magnetic structure difficult. It appears to retain a complex and unstable magnetic configuration, although has seen a recent slight decline in overall size and spot number. The region in the southwest remains by far the largest region on the disc and comprises a number of strong spots along with a very complex magnetic structure. A previous region, which lay to the east of AR3664, has now merged with AR3664. The remaining sunspots on the disc are smaller, stable and magnetically simple.

A 'full-halo' Coronal Mass Ejection (CME) associated with the long-period Strong flare from the southwest sunspot at 08/0509 UTC has been analysed, with an expected arrival time either late tomorrow (10th May) or more likely early day 3 (11th).

A large filament (arc of plasma) erupted in the northeast quadrant, starting around 08/1807 UTC. This is produced a CME which may have an Earth directed component. The long duration M-class flare is likely to have produced a CME which would be expected to be Earth directed. Analysis of both CME's will be undertaken once suitable imagery is available.

Solar Wind / Geomagnetic Activity: Solar winds declined from elevated to slightly elevated levels through the period as the connection ot the fast wind of a coronal hole continued to ease. Speeds peaked at 548km/s at 08/0256 UTC. The Interplanetary Magnetic Field was at weak levels throughout with the important north-south component also varying weakly. Geomagnetic activity was Quiet to Unsettled.

Energetic Particles / Solar Radiation: Solar radiation was at normal background levels although indicated a minor response following the Strong flare from the southwest sunspot region at 08/0509 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: High solar activity is forecast with frequent Moderate flares expected and isolated Strong flares likely, principally from the large sunspot region located in the southwest of the visible disc. New regions are also likely to rotate onto the visible disc over the coming days, helped to maintain flare activity.

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Solar Wind / Geomagnetic Activity: There are several potential Earth-directed CMEs in the forecast period. There is a slight chance for a couple of glancing impacts early on today (9th May) and also on tomorrow (10th May). A more significant CME is expected to arrive either late tomorrow (10 May), or more likely early on day 3 (11th), generated from combination of the CME's generated by the Moderate and Strong flares from the very large and active sunspot region in the southwest.

Earth is under the influence of a slowly declining HSS (High speed stream) with slightly elevated solar winds expected to fall to background levels by late tomorrow (10th May). Within the past 24 hours a new, small coronal hole has developed in the western hemisphere. if this feature persists then a weak HSS may arrive during day 3 (11th), with slightly elevated wind speeds likely. However, any HSS is likely to be masked by the effects of the significant CME arrival. Geomagnetic activity probably mostly remaining Quiet to Unsettled through the early guidance period, with a slight chance of Minor Storm (Kp5) intervals today. Activity should increase to Minor-Moderate Storm levels, with a chance of peak Strong Storm conditions, from late tomorrow or more likely early day 3 (11th). Through day with activity is expected to decline, although perhaps only gradually due to the influence of the new, small coronal hole.

Auroral activity is expected the night of 10-11 May (Friday-Saturday), a result of the Earth-directed CME that left the Sun on 08 May. Where skies are clear, sightings are expected to develop following the CME arrival across Scotland and parts of Northern Ireland, with a chance of briefly becoming visible from Northern Ireland, northern England and North Wales. Any sightings will be limited by the short overnight period at this time of year.

Energetic Particles / Solar Radiation: Solar radiation levels are most likely to remain at predominantly background levels through the period. There is an ongoing chance for a Minor Storm or greater event occurring, from the two large sunspot groups in the western hemisphere of the visible disc.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	70	90	40
Strong	G3	No	1	10	40	20
Severe	G4	No	1	1	5	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	95	95	95	95
Very Active	R3 to R5 X	Yes	50	50	50	50

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	30	30	25	25
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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